PCT/AUAU 2004/000883

REC'D 21 JUL 2004

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Twelfth day of July 2004

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CARRIER AND DRIVE ARRANGEMENT FOR A SOLAR ENERGY REFLECTOR SYSTEM

FIELD OF THE INVENTION

This invention relates to a carrier/drive arrangement for a solar energy reflector system of a type that is employed for reflecting incident radiation to a distant solar energy collector system.

BACKGROUND OF THE INVENTION

Various solar energy reflector-collector systems have been developed for use in harnessing solar radiation that falls incident over areas that might range in size from $5x10^1$ m^2 to $25x10^6$ m^2. In this context reference is made to collector systems that have been disclosed in Australian Patents 694335 and 724486 dated 28 March 1996 and 19 December 1997 respectively.

The most relevant of the earlier known reflector-collector systems, including those disclosed in the referenced patents, employ a field of reflectors which are driven to track movement of the sun (relative to the earth) and which are orientated to reflect incident radiation to distant, elevated collector systems. In the case of the system that is disclosed in Patent number 694335, at least some of the reflectors are mounted and arranged to be driven in a manner such that their orientation may be changed to move the direction of reflected radiation from one collector system to another.

The present invention has been developed from a perceived need for a carrier that is suitable for supporting a reflector element in a reflector system and which also provides for convenient transmission of sun-tracking drive from an electric drive motor.

SUMMARY OF THE INVENTION

Broadly defined, the present invention provides a carrier/drive arrangement for use in a solar energy reflector system and which comprises a carrier structure having a support portion for supporting a reflector element and a skeletal frame portion that includes hoop-like end members between which the support portion extends. Support members are provided for supporting the carrier structure by way of the end members and for accommodating turning of the carrier structure about an axis of rotation. Also, a drive system is provided for imparting turning drive to the carrier structure by way of at least

one of the end members.

PREFERRED FEATURES OF THE INVENTION

The drive system preferably is arranged to impart unidirectional drive to the carrier structure by way of one only of the end members of the skeletal frame portion of the carrier structure.

By providing a system in which unidirectional rotation is imparted to the carrier structure, as preferred, the traditional requirement for a reversible motor, with attendant backlash and other problems, is avoided. Also, during the process of rotating the carrier structure through 360 degrees during each 24-hour period, the carrier structure may be parked in a selected angular position with the reflector element orientated downwardly to shield it from adverse ambient conditions. Furthermore, the carrier structure may at any time within each 24-hour period be rotated temporarily to a selected angular position with the reflector element orientated in a direction away from potentially damaging climatic conditions.

The hoop-like end members of the skeletal frame portion of the carrier structure preferably extend about the axis of rotation of the carrier structure and the axis of rotation preferably is located adjacent to or, most preferably, is coincident with a longitudinal axis of the reflector element

The support portion of the carrier structure preferably comprises a corrugated metal panel-like platform and, in such case, the reflector element will be supported upon the crests of the corrugations. Furthermore, the corrugations preferably extend in the direction of the longitudinal axis of the reflector element and the platform preferably is curved concavely in a direction orthogonal to the longitudinal axis of the reflector element.

The support members for the carrier structure or, more specifically, for each of the hoop-like end members, preferably comprise groups of spaced-apart supporting rollers. The rollers of each group preferably are arranged to track within a channel region of a respective one of the hoop-like end members.

The drive system for imparting drive to the carrier structure preferably incorporates a link chain that extends around and is fixed to one of the end members to form, in effect, a gear wheel. With this preferred arrangement a sprocket will be provided to engage with the link chain

and to impart drive to the end member from an electric motor or other form of motor.

With this drive arrangement, a relatively inexpensive electric motor may be employed and, with appropriately sized end members of the carrier structure, a high reduction in drive velocity and a commensurate increase in torque transmission is obtained.

The reflector element may comprise a single panel-shaped glass mirror or a reflective metal panel, but it preferably comprises a plurality of square or rectangular glass mirrors that are mounted in edge abutting relationship upon the platform portion of the carrier structure. In this case the rear, silvered faces of the mirrors may be protected against adverse ambient conditions by sealing surrounding gaps and spaces with a silicone or other suitable sealant. When, as in the preferred arrangement, the panel-like platform for the reflector element is curved concavely, the reflector element will be secured to the platform in a manner such that the concavity will be transferred to the reflecting surface of the reflector element.

The invention will be more fully understood from the following description of a preferred embodiment of a reflector system that incorporates the above described carrier/drive arrangement and as shown in the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings-

Figure 1 shows a perspective view of the reflector system with a carrier structure of the system rotated to an angular position in which a reflector element is orientated to reflect in an upward direction,

Figure 2 shows a perspective view of the same reflector system but with the carrier structure rotated through approximately 180 degrees to expose the underside of a platform for the reflector element, and

Figure 3 shows a portion of an end member and a drive system of the reflector system, the illustrated portion being that which is shown encircled in Figure 2.

DETAILED DESCRIPTION OF THE INVENTION

As illustrated, the reflector system in its preferred form comprises a carrier structure 10 to which a reflector element 11 is mounted. The carrier structure itself comprises an elongated panel-like platform 12

which is supported by a skeletal frame structure 13 which includes two hoop-like end members 14. The members 14 are centred on and extend about the longitudinal axis of the reflector element 11.

In terms of overall dimensions of the reflector system, the platform 12 is approximately 12.0 m long and the end members 14 are approximately 2.0 metres in diameter.

The platform 12 comprises a corrugated metal panel and the reflector element 11 is supported upon the crests of the corrugations. The corrugations extend in the direction of the longitudinal axis of the reflector element 11, and the platform 12 is carried by six transverse frame members 15 of the skeletal frame structure 13. End ones of the transverse frame members 15 effectively comprise diametral members of the hoop-like end members 14.

The transverse frame members 15 comprise rectangular hollow section steel members and they are formed with a curvature of approximately thirty-eight metres radius so that, when the platform 12 is secured to the frame members 15, the platform is caused to curve concavely (as viewed from above) in a direction orthogonal to the longitudinal axis of the reflector element 11. The same curvature is imparted to the reflector element 11 when it is secured to the platform 12.

The skeletal frame 13 of the carrier structure 10 also comprises a rectangular hollow section steel spine member 16 which interconnects the end members 14, and a space frame which is fabricated from tubular steel struts 17 connects the transverse frame members 15 to the spine member 16. This skeletal frame arrangement provides the carrier structure 11 with a high degree of torsional stiffness.

The hoop-like end members 14 are formed from channel section steel and each of the members 14 is supported for rotation on a support arrangement that comprises two spaced-apart rollers 18. The rollers 18 are positioned to track within the channel section of the respective end members 14, and the rollers 18 provide for rotation of the carrier structure 10 about an axis of rotation that is substantially coincident with the longitudinal axis of the reflector element 11.

A drive arrangement (see Figure 3) is provided for imparting unidirectional drive to the carrier structure 10 and, hence, to the reflector element 11. The drive arrangement comprises a shaded pole or other similar such non-reversing electric motor 19 having an output

shaft coupled to a sprocket 20 by way of reduction gearing 21, and the sprocket meshes with a link chain 22 through which drive is directed to the carrier structure 10.

The link chain 22 extends around and is fixed to the periphery of the outer wall 23 of the channel-section of one of the end members 14 to form a type of gear wheel with which the sprocket 20 engages.

With the end member 14 having a diameter in the order of 2.0 m and the sprocket 20 having a pitch circle diameter of 0.05 m, reduction gearing and torque amplification in the order of (40.R):1 may be obtained, where R is the reduction obtained through gearing at the output of the electric motor 19.

The reflector element 11 is formed by butting together five glass mirrors, each of which has the dimensions 1.8 m X 2.4 m. A silicone sealant is employed to seal gaps around and between the mirrors and to minimise the possibility for atmospheric damage to the rear silvered faces of the mirrors.

The mirrors have a thickness of 0.003 m and, thus, they may readily be curved in situ to match the curvature of the supporting platform 12.

Depending upon requirements, two or more of the above described reflector systems may be positioned linearly in a row and be connected one to another by way of adjacent ones of the hoop-like end members 14. In such an arrangement a single drive arrangement may be employed for imparting unidirectional drive to the complete row of reflector systems.

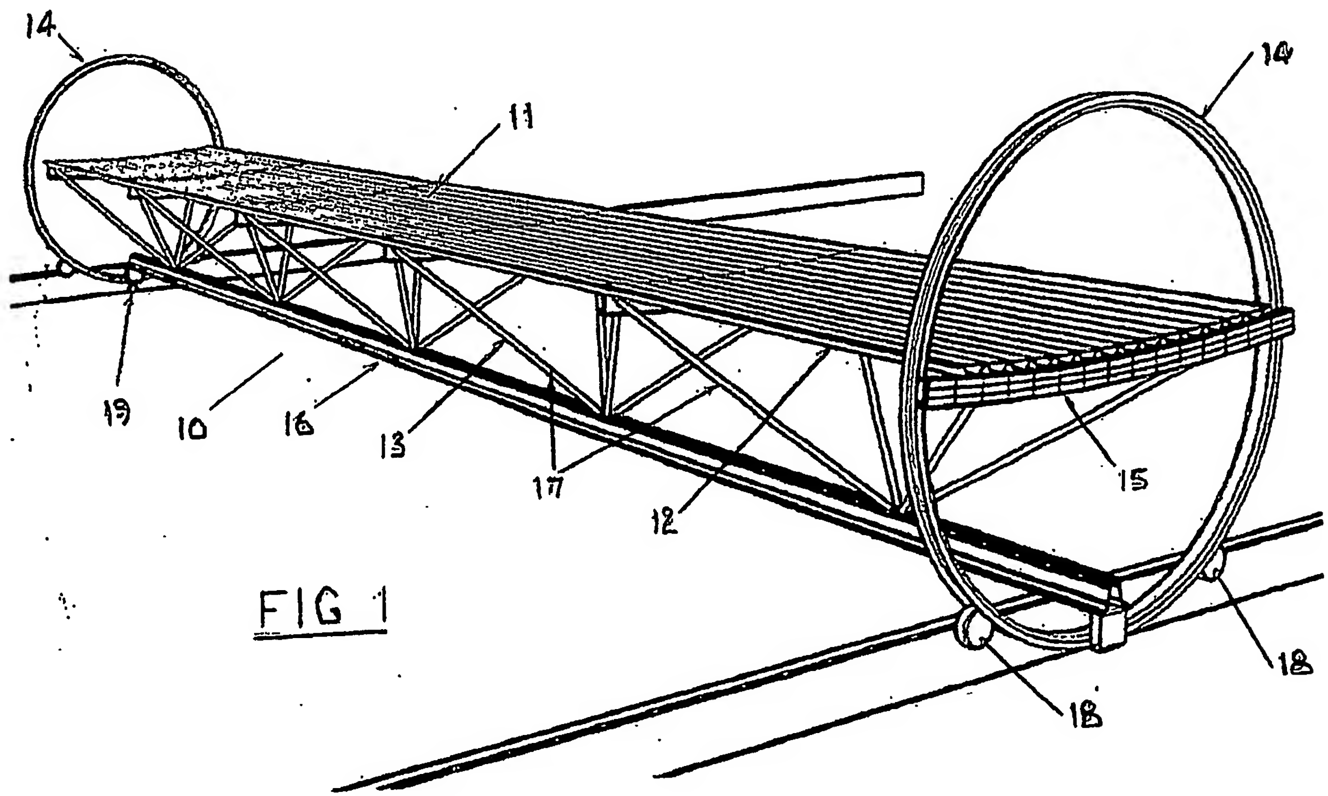

FIG 1

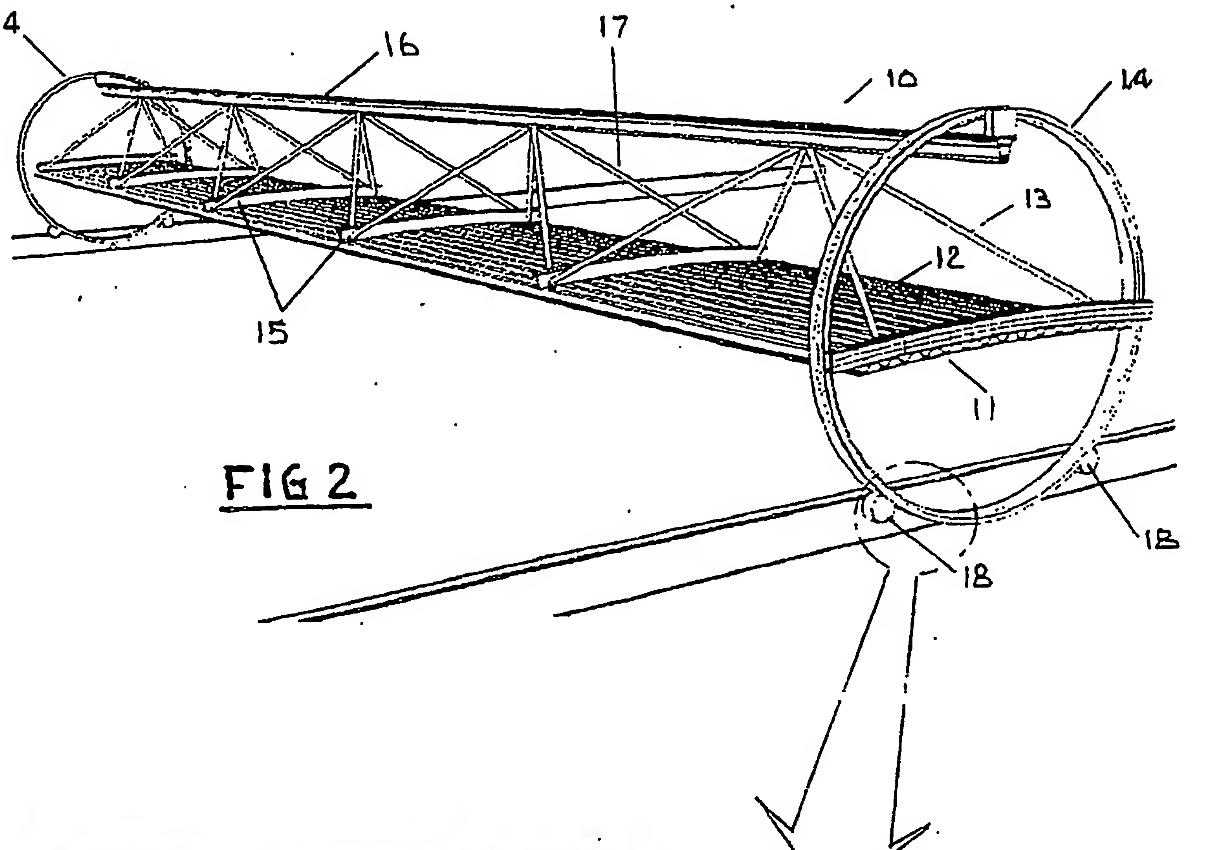

FIG 2

FIG 3